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Intelligent Food Dispenser (IFD)

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Abstract: *Animals require special treatment and care. This task is not as easy as it is because of today's busy lifestyle. This work is aimed at introducing, designing and implementing a smart pet system. In today's world, there is a growing focus on the regular interactions between human and physical devices. So, the most important issue recently was how to raise pets in an easy way. This work focuses on improving local awareness by applying it to the pet's daily routine and easily enhancing the animal's activity and eating control. The aim is to enable animal owners to automate simple things, such as monitoring and feeding.The purpose of this paper is to make use of automated feeders to maintain a particular amount of food for pets which suits their requirements and giving them access to all the necessary proteins and fibers for their healthy growth thus preventing obesity and various other diseases related to it. It offers new and developed way of feeding pets without the need of human intervention with low food alert and feeding alert.*

Keywords: *dispenser, feeder, pets, smart system*

I. Introduction

Our paper concentrates on the use of Intelligent Pet Feeder with the help of an FRDM-KL25Z board.The emphasis on choosing this as the title is to solve a problem faced by nearly every pet lover. A pet is nowadays very common amongst households. Pets are also considered as members of the family. Since this is the case it is also necessary to look after the health and physique of the pet. Although there are some already proposed methods of feeding with buzzers incorporated in them, these feeders still need users to manually set the timer for the buzzer to make a noise to alert the pet about its meal. With the addition of some new technologies, pet feeder can be made smart thus allowing it to interact with other devices [1]. The idea of automatic food dispenser has developed from the thought of feeding pets when the owners are not in proximity or are busy with work thus loosing track of time which causes irregularities in the feeding patterns. The purpose of this paper is to make use of automated feeders to maintain a particular amount of food for pets which suits their requirements and giving them access to all the necessary proteins and fibers for their healthy growth thus preventing obesity and various other diseases related to it. This project offers a new and developed way of feeding pets without the need of human intervention with low food alert and feeding alert.

II. Related Work

A few researches have already been done in the field of automation of pet feeding. It is already mentioned in the research paper by Dirk Van der Linden that the intervention of technology in pet care systems has improved pet care and eased it out for distant pet owners [2]. In the researches such as Automatic pet feeding and monitoring system and others, it is shown how the actual model will be operated [1][3][4]. Dogs being the majority of pets are kept within a certain cycle of food consumption, so they do not fall prey to obesity [5]. Along with controlling the intake and monitoring of the food intake, one can also provide medications on a regular basis to the pets, or, even the bedridden patients as shown in the research work in pill dispensing and uninterrupted medication with alarm and smartphone notification [6][7].The medications are recorded, and the doses are given accordingly [7][8]. In further development of the application and hardware animal tracking is to be implemented. The animal tracking uses RFID tags and gives the real time location of the pets on the thingspeak platform. Also, it can summarize the weekly/monthly intake of food of the pets [1][9][10]. The most common operating hardware used is Arduino and the software being mobile phone apps.

III. Importance and Requirement

The paper is concentrated on the health and weight management of domestic pets thus causing less problems to the owners. Automatic pet feeders allow to feed a pet without the owner being present and this is one of the best features that allows the owners to get over their lack of sleep in case they suffer any, due to their pets. About 56% of pets are overweight, which can cause serious health risks including heart and respiratory disease, kidney disease, and diabetes [1].Automatic feeders help provide proper weight management by giving the pet the portioned feedings they need. This Intelligent food dispenser is designed to store food for a number of servings. This automatic feeder will serve the pet meals for 24 hours exactly when you want it to. This is how you can be sure that the pet has the food for the entire day portioned as the owner wants it to be.

IV. Proposed Architecture

Considering the various scenarios and hurdles related to hospitality of pets, it it very much necessary to address this issue. The Project is focused on management of domestic pets. Given the big demand there is a huge scope of innovation both in terms of improving the hardware and software aspects, we have implemented the same using the latest FRDM KL25Z board, ESP8266 module and a cloud-based system that is a software as a service (SaaS) which is free to use to design, debug and compile [2].The wifi module being implemented here is the ESP8266 which is used by the FRDM KL25Z board to communicate to theuser via a secure wireless connection via standard IEEE networking protocols. The ESP8266 is an inexpensive Wi-Fi microchip manufactured in Shanghai, China, with full TCP / IP stack.

The Wi-Fi module helps the FRDM to connect to the Wi-Fi and can thus be indirectly used to interface the board to an android app for board control. The features of this module include Wi-Fi 2.4 GHz, support WPA or WPA2, super small module size and standby power consumption of less than 1.0mW.The old models still require remote control but can be easily automated thus completely removing human intervention[3].The DC Motor we're using here consumes up to 9V. We are generally using just one motor to perform the rotating action of the container in which the feed is added. This usage of only one motor helps in reducing the total consumption of power which is a plus point in this method of implementation.

The different components used for the project are as described below:

4.1 FRDM-KL25Z ARM Board:

The board uses NXP KL25Z Kinetis KL2x MCU which has the following features:High performance ARM Cortex-M0+ Core, 48MHz, 16KB RAM, 128KB FLASH, MMA8451Q - 3-axis accelerometer, capacitive touch sensor, Built-in USB drag 'n' drop FLASH programmer. It uses MBED ide for coding and compiles the code into .bin format which can easy be burned onto the board through a USB chord by just pasting the .bin file into it.

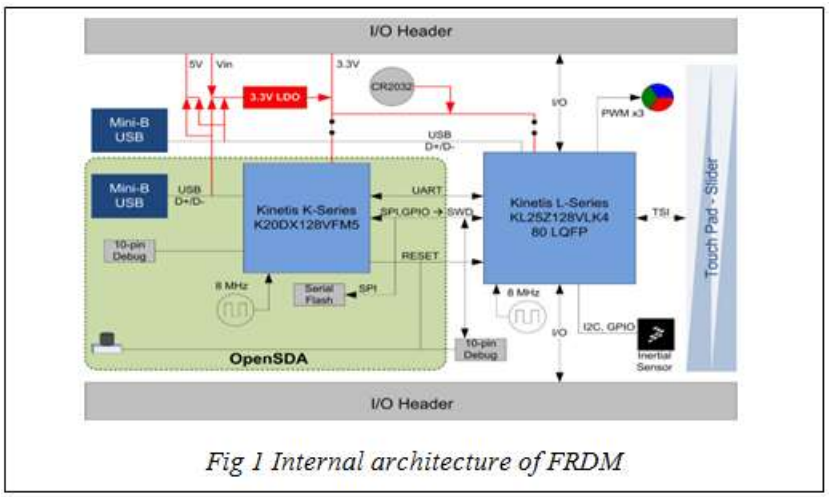

Fig 1 Internal architecture of FRDM

4.2Relay Circuit:

Relays are electromechanical devices that activate a pair of mobile contacts from an open to a closed position usin ganelectromagnet.

The advantage of relays is that operating the relay coil requires a relatively small amount of power,

but the relaycan be used to control devices that consume relatively higher power. This easy and power saving feature of the relay is used in our project to control the rotation of the motor as an alternative to the costly and

power consuming motor boards which can perform multiple functions, thus wasting power since there is only single function required.

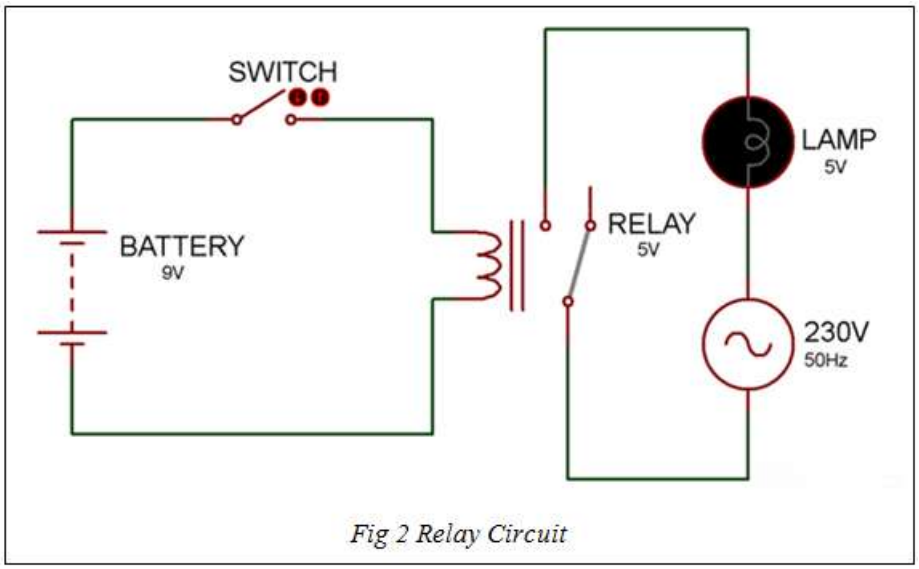

Fig 2 Relay Circuit

The block diagram below gives a basic idea about the integration of various modules mentioned above. The overall power supply required for the IFD include 4.5 to 9V for the board and 9v supply to the DC Motor. The supply to the relay is provided through the Vout pin (3V3) thus saving a little bit of power which is a progress.

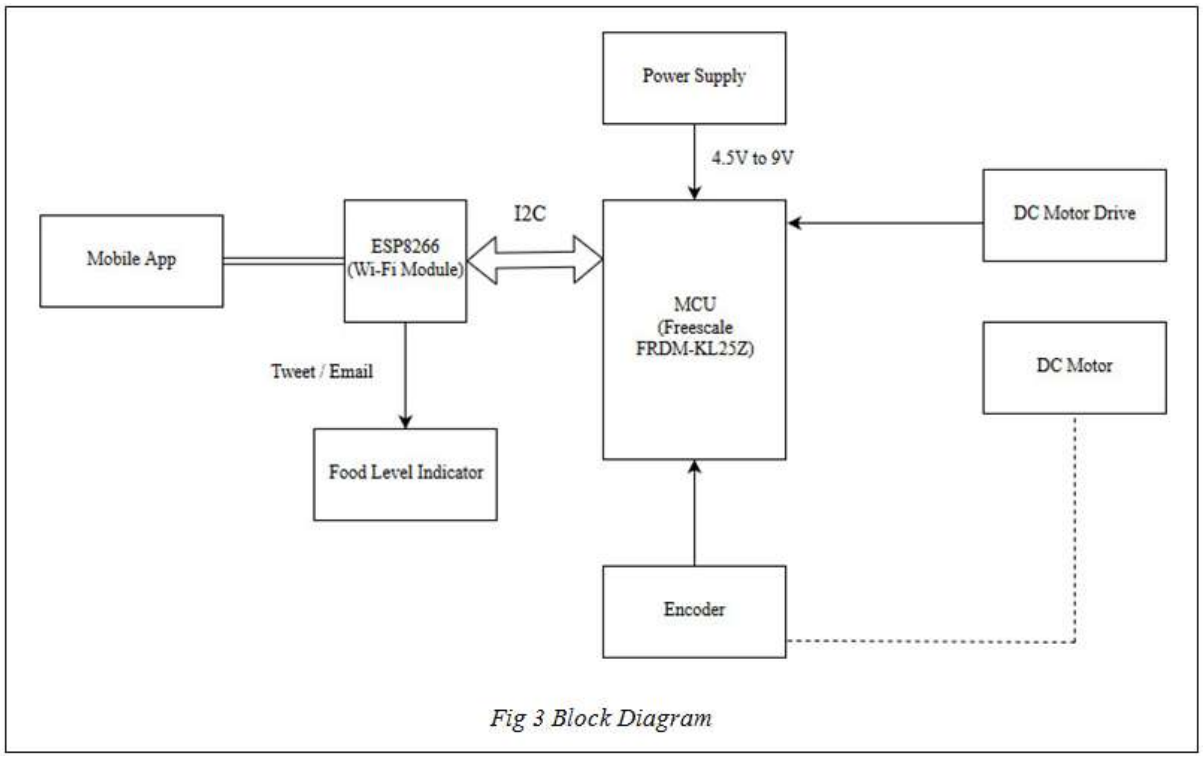

Fig 3 Block Diagram

V. Implementation & Operation

The food dispenser is controlled using an android app which gives the control to the device through a Wi-Fi module (ESP8266) for dispensing the food [2]. The microcontroller FRDM KL25Z is programmed in such a way that it sets the motor working. There are two basic functional parts for dispensing of the food. The storage box used for storing the food has an opening on the storage. The storage box has a lid beneath it. This lid is attached to a DC motor which is interfaced with the FRDM board. The amount of time the openings of both lid

and storage box coincide will decide the amount of food dispensed. After the food is dispensed, the motor is programmed to rotate thus closing the lid. The android application proves helpful in this case. It can control the time for how long the motor stays in the opening position.

The android app is an intuitive way to control and monitor the operation of the Intelligent Food Dispenser (IFD). Fundamentally, the app consists of 4 frames. Following is the implementation of the android app:

The introduction screen (initial screen): It displays the location of the device on the map. Below the map is the button to proceed to further screens. This screen is the first basic screen of the android app. This is the screen that loads up when the app is initialized or opened for the first time. Here, three horizontal layout sections have been used. In the first layout the logo that is a .jpg image has been used. Then the in second layout, a map-view component is placed. It is an open-source map and is freely available. This map-view has attributes such as pin, location, co-ordinates etc. The last horizontal layout in the screen is for the start button. This button has been programmed such that when this button is clicked the app transitions to the next screen, that is the second screen.
The second screen: It contains 3 simple components. The first one is the image. Beneath that are two button layouts. These two buttons provide two separate actions. One of them will take the user to the time picker section of the app. The other button will lead the user into the third screen. The time picker screen: It is an interface that consists of timer control. The information screen: It provides basic information and FAQ about the IFD and the app.

Fig 4 App Homescreen

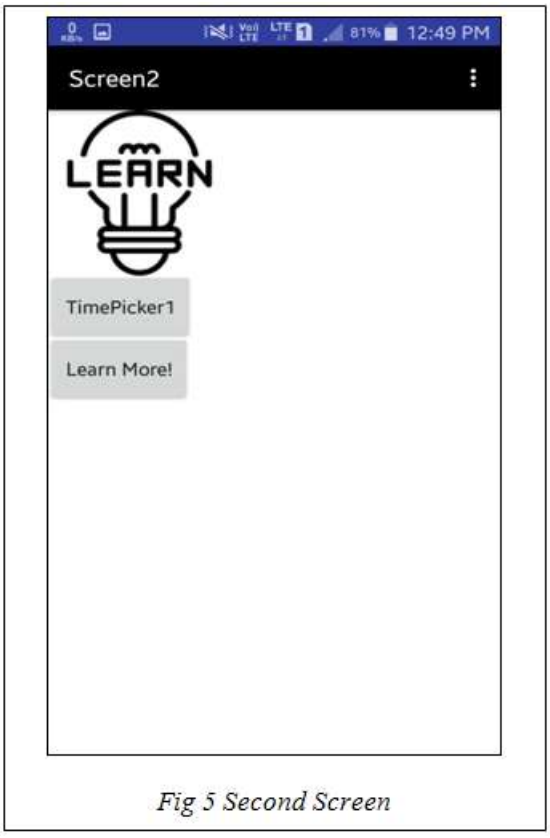

Fig 5 Second Screen

Fig 6 Time Selection

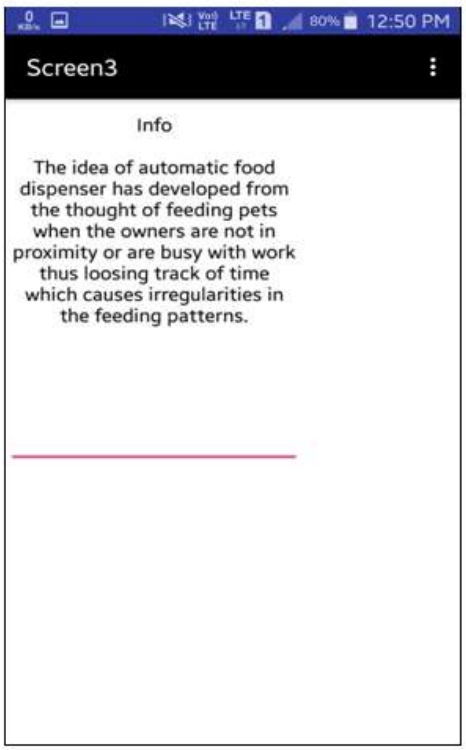

Fig 7 Information Screen

VI. Flow Diagram

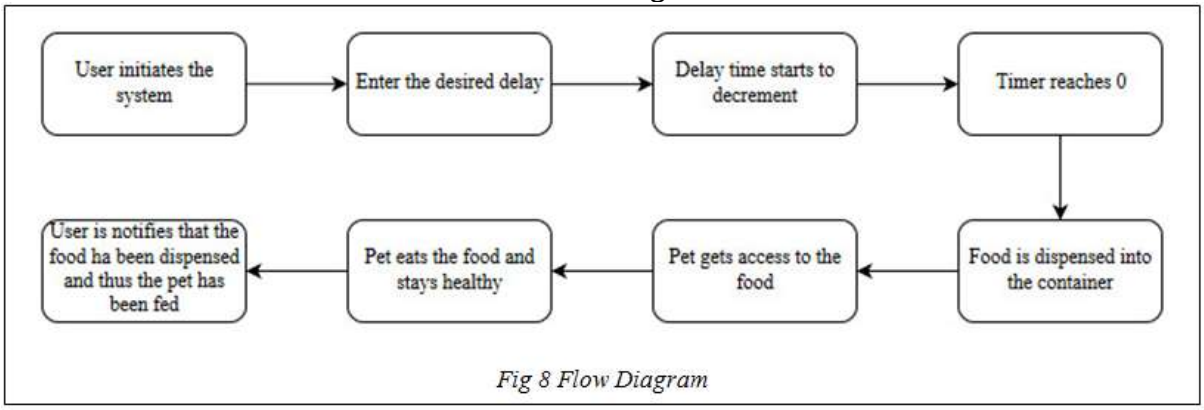

Fig 8 Flow Diagram

System will be powered up by the user.Desired delay time will be entered by the user, after which dispensing will take place.Now the delay time will start decrementing and will finally reach termination. When the delay timer reaches 0, food will be dispensed into the container. Pet gets access to the food. User is notified and thus is satisfied that the pet has been fed.

VII. Result &Future Scope

Given the big demand there is a huge scope of innovation both in terms of improving the hardware and software aspects. Further innovations would comprise of a product in which all the features are included in a modernized machine with low maintenance. Water also being a requirement, future developments can be done. The water bowl often stays on the floor filled with stagnant water and thus collects dirt and grime that the pets may drink. Automated pet fountains can be installed thus not allowing the water to be stagnant and preventing contamination. The old models still require remote control but can be easily automated thus completely removing human intervention. More upgrades can be made to the model by improving sanity levels due to constant food

storage, the food may get spoiled, so sensors can be added to alert the owner about change of food also the material of the dispenser can be chosen accordingly.

Following are the applications:

Food intake Monitoring: The main intent of the project is to dispense food and take care of the daily intake of the food of the pets. So, it can monitor the amount of the food the pet takes in a day and helps you decide the amount so that the obesity is kept in check.

Medicine Dispensing: The food dispenser can also be used as a means to dispense medicine to the bedridden patient who need to consume medicine from time to time. The timer can be adjusted according to the medicine schedule of the patient.

Pet Care: When the owners of the pets are away, the IntelligentFood Dispenser can be set by a timer and amount can be decided so that it gives the food to pets timely.

Pet Medications: The pets that are on medications can be easily given the medicine by dispensing it with the food.

VIII. Conclusion

This paper primarily intends to provide a solution to pet care. It has demonstrated a cost-efficient method that makes use of a popular development board, the 'ARM FRDM KL25Z', an android application and some other standard peripheral devices. The usage of the device has been simplified due to its modular design and by providing an app interface. Thus, it can be concluded that when this system is developed further ahead at a later stage, it can be easily enhanced by incorporating GSM module, RF id tags and much more.

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